
TurboVUi™

by CTI Products, Inc.

System Planner

For Version 5.x Software

Document # S2-61645-500



Contact Information

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INTRODUCTION – TURBOVUI SYSTEM OVERVIEW

TurboVUi™ provides remote access to MOTOTRBO radios via IP Networks. PC-based software allows voice communications between PC users and 2-way radio subscribers. Communications with radio subscribers is also possible for mobile users using Android or iOS devices. A TurboVUi system consists of at least one TurboVUi IP Gateway (server) and at least one client (Dispatch™, Solo™, or Pocket™) with an IP network connecting the TurboVUi components.

TURBOVUI COMPONENTS

The TurboVUi system is based on Server-Client architecture. The TurboVUi system components are described below:

- **TurboVUi IP Gateway Kit** (CTI Part # S2-61528)
This is hardware interface connects a MOTOTRBO XPR4550 control station radio to an IP network. The IP Gateway is the Server for the control station radios connected to it. Each control station radio used for voice requires one IP Gateway. A maximum of three additional control station radios used for GPS Data Revert may share the voice IP Gateway. TurboVUi system components, such as IP Gateways, may be located together or separated geographically and connected via a Wide Area Network (WAN) or Virtual Private Network (VPN). Each IP Gateway requires a static IP address. Each IP Gateway includes a cable to connect it to the XPR4550 Control Station radio. For more information, see the following documents:
TurboVUi IP Gateway - Installation and Configuration Manual, Document # S2-61534
TurboVUi System Brochure
- **TurboVUi Dispatch™ Client** (CTI Part # S1-61603)
This dispatch console application for PCs provides voice dispatching to multiple simultaneous radio channels or talk groups. Other features include Texting, GPS Mapping of radio subscribers, and Voice Logging. Either Windows 7 Pro or Windows XP Pro operating system is required. TurboVUi system components, such as Dispatch Clients, may be located together or separated geographically and connected via a Wide Area Network (WAN) or Virtual Private Network (VPN). For more information, see the following information:
TurboVUi Dispatch Software Installation Guide, Document # S2-61535
TurboVUi Dispatch User Guide, Document # S2-61577
TurboVUi System Brochure
- **TurboVUi Solo™ Client**
This software application for PCs provides voice dispatching to a single radio channel or talk group. It requires Windows 7 or Windows XP operating system. The virtual radio head duplicates the full functionality of a control station, including channel steering. Other features include Texting and Voice Logging for 24 hours. TurboVUi system components, such as Solo Clients, may be located together or separated geographically and connected via a Wide Area Network (WAN) or Virtual Private Network (VPN). For more information, see the following documents:
TurboVUi Solo Client – Quick-Start Guide, Document # S2-61568
TurboVUi System Brochure
- **TurboVUi Pocket™ App for Android™ and iPhone™/iPad™ mobile devices**
A mobile app that is used for voice dispatching to a single radio channel or talk group. The virtual radio head duplicates the full functionality of a control station, including channel steering. Other features include Texting and GPS Mapping of radio subscribers. For more information, see the following documents:
TurboVUi Pocket App Quick-Start Guide, Document # S2-61620
TurboVUi System Brochure
- **Control Station Radio**
A MOTOTRBO XPR4550 control station radio must be used as the interface to the radio system, and connects to a TurboVUi IP Gateway using the rear accessory port. Each control station radio used for voice requires one IP Gateway. A maximum of three additional control station radios used for GPS Data Revert may share a voice IP Gateway.

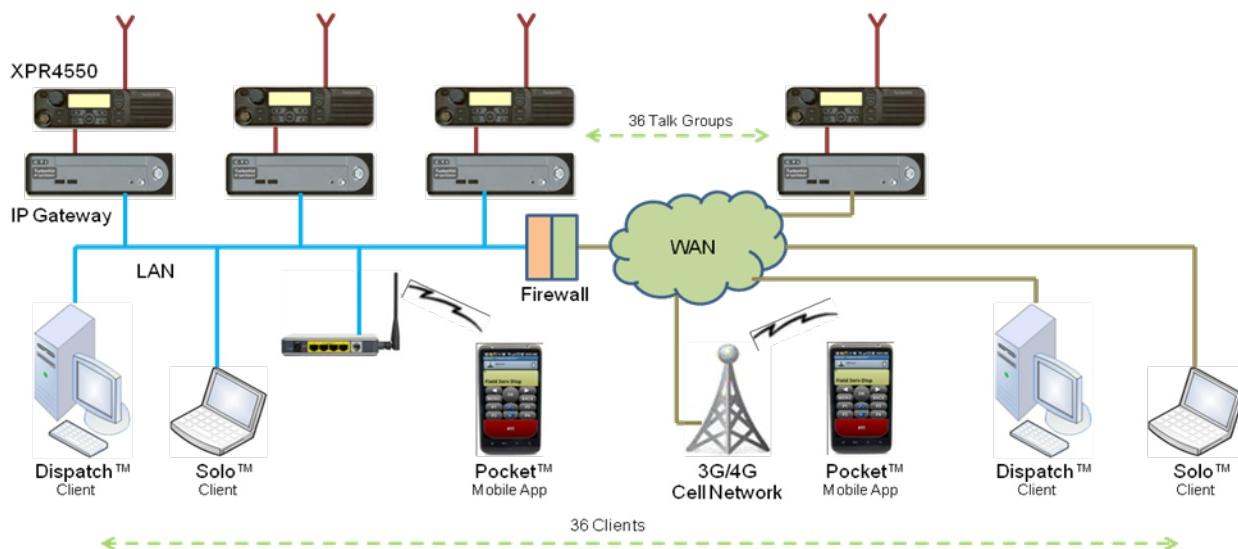
- Personal Computer or Workstation**

A PC or workstation is required to host the TurboVUi Dispatch client or TurboVUi Solo client. Console accessories may include microphone and speakers (or headset), Push-to-Talk footswitch, and touch screen monitor.

ARCHITECTURE

The IP Gateways interface the radio system to an IP network, ensuring easy wide-area deployment without configuring server PCs. One IP Gateway is required for each control station radio used for voice. The IP Gateways and control station radios can be centrally located or scattered among different locations using a Virtual Private Network (VPN) or Wide Area Network (WAN) such as the Internet.

A system may have a mixture of TurboVUi Dispatch and TurboVUi Solo Clients, as well as TurboVUi Pocket apps running on mobile devices. Dispatch Clients, Solo Clients, and Pocket apps can be centrally located or scattered among different locations using a Virtual Private Network (VPN) or Wide Area Network (WAN) such as the Internet.



System Limitations

System limitations include the following:

System Component	Maximum
Dispatch Clients	12
Simultaneous Solo Client and Pocket mobile app connections	36
IP Gateways	36

ENVIRONMENTAL CONSIDERATIONS

The operating environment for the IP Gateway must be within limits noted in the specifications, as well as other conditions. Do not install equipment in an area where any of the following exist:

- Extreme temperature and humidity beyond limits listed in the specifications
- High EMI (Electro-Magnetic Interference) or RFI (Radio Frequency Interference)
- High dust concentration
- High ESD (Electrostatic Discharge)
- Extreme Vibration

RF Interference

To prevent RF interference, **Mobile radio antennas** should be kept a **minimum of 24 feet** from the TurboVUi IP Gateway when in high-power mode, or a **minimum of 12 feet** when in low-power mode. **Portable radios** should be kept a **minimum of 6 feet** from the TurboVUi IP Gateway.

Lightning and Fire Protection

Lightning protection should be implemented at both the equipment and at the point of entry of the building. Lightning protection and power transient protection should be implemented to reduce the risk of fire caused by these phenomena. Circuit breakers and fuses offer the best methods for preventing extended over-current and over-voltage conditions.

Power Requirements

When using the supplied AC power adapter, each IP Gateway requires 100-240VAC, .25A maximum.

When connecting a DC supply directly to the IP Gateway, each IP Gateway **requires 11.5 – 12.5 VDC**, 2.5A maximum. When the DC supply is a standard 13.8VDC used for battery recharging, use CTI's Diode Dropping assembly (S2-61593) in series between the 13.8VDC power supply and the IP Gateway.

STATIC IP ADDRESS

Each TurboVUi IP Gateway **requires a static IP address**. The IP Gateway must have IP Network Parameters configured using ICU.exe (IP Configuration Utility) before connecting to an active network. Contact your IT administrator to provide a static IP Address for each TurboVUi IP Gateway, along with its Subnet Mask and Default Gateway.

TURBOVUI SYSTEM PLANNER TEMPLATE

Use the System Planner Template at the end of this document to record IP addresses, device names, and passwords.

ACCESSING THE TURBOVUI IP GATEWAY USING PORT FORWARDING

If TurboVUi clients (such as Solo, Dispatch, or Pocket) will access an IP Gateway from a different IP network, then the IT Administrator must configure port forwarding within the firewall or router that separates the TurboVUi IP Gateway from other networks. This is also true when one or more of the clients listed above will connect to a TurboVUi IP Gateway from the Internet.

See section "***Appendix - Configuring Port Forwarding on Routers***" on Page 29 for more information.

LICENSING***TurboVUi Dispatch Clients***

Each PC that runs the TurboVUi Dispatch client requires a USB hardware key and software license file. The USB hardware key contains an encrypted Serial Number. The license file with the same Serial Number specifies the number of IP Gateways that can be connected using TurboVUi Dispatch. The USB hardware key must remain installed in the PC when running TurboVUi Dispatch. Connections for additional IP Gateways can be purchased and added to the license file at any time.

TurboVUi Solo Clients and Pocket Apps

For client types other than TurboVUi Dispatch, a license file that is factory-installed on the IP Gateway allows connections from Solo clients (for PCs and Notebooks) and Pocket apps (for Android™ and iPhone™/iPad™). Each IP Gateway is shipped with a factory-installed license file allowing at least one connection. Additional connections can be purchased with IP Gateway, or can easily be added to an IP Gateway that is already installed. Single or five-pack connection add-ons can be purchased for the IP Gateway license file, up to a maximum of 36 connections. The number of connections purchased should be the maximum number of simultaneous connections from PCs running the Solo client, and mobile devices (Android™ and iPhone™/iPad™) running the Pocket app.

The number of connections installed on the license file is indicated on the serial number label located on the bottom of the IP Gateway. The number of installed connections can also be determined from a connected TurboVUi Solo client if logged in using the “admin” username using the following steps:

1. From the **Settings** menu, choose **Gateway**.
2. In the **TurboVUi Gateway Settings** window, click the **Admin** tab. The “Client Licenses” parameter will show the number of purchased connections.

TURBOVUI VERSION MATCH

TurboVUi Software for the IP Gateway and Clients (Dispatch, Solo and Pocket for mobile devices) must all have compatible versions in order to communicate with each other. Compatibility occurs when the first two digits of the version are identical. (The third digit indicates a minor revision, and does not need to match.)

WHAT IS INCLUDED

TURBOVUI IP GATEWAY KIT

The TurboVUi IP Gateway Kit (Part # S2-61528) includes the following items:

CTI Part #	Description	Notes
S3-61530	TurboVUi IP Gateway	Includes power supply, 100-240VAC to 12VDC
S2-61534	Manual, TurboVUi IP Gateway Installation Guide	Read me first
S2-61568	Manual, TurboVUi Solo Client Quick-Start Guide	Use only if Solo Client(s) to be installed
S2-61620	Manual, TurboVUi Android Client Quick-Start Guide	Use only if Android Client(s) to be installed
S2-61565	CD, TurboVUi IP Gateway	Contains ICU.exe, Solo Client Install Program, and manuals listed above
S2-61431	Cable, Radio Interface for Audio and Control	Interface cable between IP Gateway and XPR4550, for Audio and Control signals
S2-60760	Cable, Cat 5 RJ45 Cross-over, 3 ft	Used with ICU.exe during IP Gateway configuration
89-10712	Cable, Cat 5 RJ45, 10 ft	Can be used to connect IP Gateway to LAN

Note: ICU.exe is available on either of the following distribution CDs:

- “TurboVUi IP Gateway”, Part Number S2-61565. This CD contains ICU.exe (executable file) that must be copied to a writeable disk before running. (ICU.exe cannot be run directly from non-writeable data storage such as the distribution CD.)
- “TurboVUi Dispatch”, Part Number S2-61506. This CD contains an installer program that will install the TurboVUi Dispatch Client Software and ICU.exe onto the PC. Following the installation from the distribution CD, this utility can be located by clicking the **Start** menu button, then click on **All Programs**, then click on the **TurboVUi Dispatch** folder, then click **TurboVUi ICU**.

TURBOVUI DISPATCH CLIENT PACK

The TurboVUi Dispatch Client Pack (Part # S1-61603) includes the following items:

CTI Part #	Description	Notes
S3-61506	TurboVUi Dispatch Software CD	
S2-61529	TurboVUi Dispatch Serialized Software License CD	Must match Serial Number of USB Key
90-11864	TurboVUi Dispatch USB Hardware Key	Must match Serial Number of License CD
S2-61535	Manual, TurboVUi Dispatch Software Installation Guide	
S2-61577	Manual, TurboVUi Dispatch User Guide	

OTHER ITEMS NEEDED**MOTOTRBO XPR4550 CONTROL STATION RADIO**

Each MOTOTRBO XPR4550 Control Station radio used for voice requires one IP Gateway. A maximum of three additional control station radios used for GPS Data Revert may share an IP Gateway. The MOTOTRBO XPR4550 **must have firmware Version 1.6.x or later.**

XPR4550 PROGRAMMING CABLE

A radio programming cable is required to configure the XPR4550 Control Station radio, subscriber radios, and repeaters.

A programming cable connected to the front microphone connector on the XPR4550 will prevent communications to a TurboVUi IP Gateway from the Rear Accessory Connector. **Therefore, when a cable is connected to the Rear Accessory Connector to connect a TurboVUi IP Gateway or a PC (during programming), ensure that the programming cable has been disconnected from the front microphone connector.** CTI Cable S2-61431 may be used as a programming cable in lieu of the Motorola programming cable.

Laptop or PC

A laptop or PC will be needed to run the ICU.exe utility mentioned in the previous section.

WINSJIPPTRBO PROGRAMMING UTILITY

This utility will be needed if the XPR4550 control station is equipped with a Scholer-Johnson LTR option board. This utility is available from the following sources:

- Motorola On-Line (MOL)
- Scholer-Johnson at (407) 645-5093 or support@sjibiz.com

Note: TurboVUi will have very limited functions when connected to an XPR4550 control station equipped with a Scholer-Johnson LTR option board. The available functions are limited to PTT/transmit and receive audio, as well as duplication of the control station radio display.

DATA REVERT CABLE

An IP Gateway (software version 5.1.5 or later) can be used to connect as many as three Control Station Radios used for GPS Data Revert, as well as the Control Station Radio used for Voice. Order **Radio Interface Cable for Data Revert # S2-61664** for each Data Revert Control Station Radio in the system. This cable carries only USB control signals, and cannot be used to connect the Voice Control Station Radio.

The **Radio Interface Cable for Audio and Control # S2-61431** included with the IP Gateway is best used to connect the Voice Control Station Radio. This cable carries both USB control signals as well as analog audio signals.

CONFIGURATION AND INSTALLATION STEPS

Use the steps in the following table to install a TurboVUi System. Following installation of the IP Gateway in Step 1b, at least one Client must be installed from Step 5.

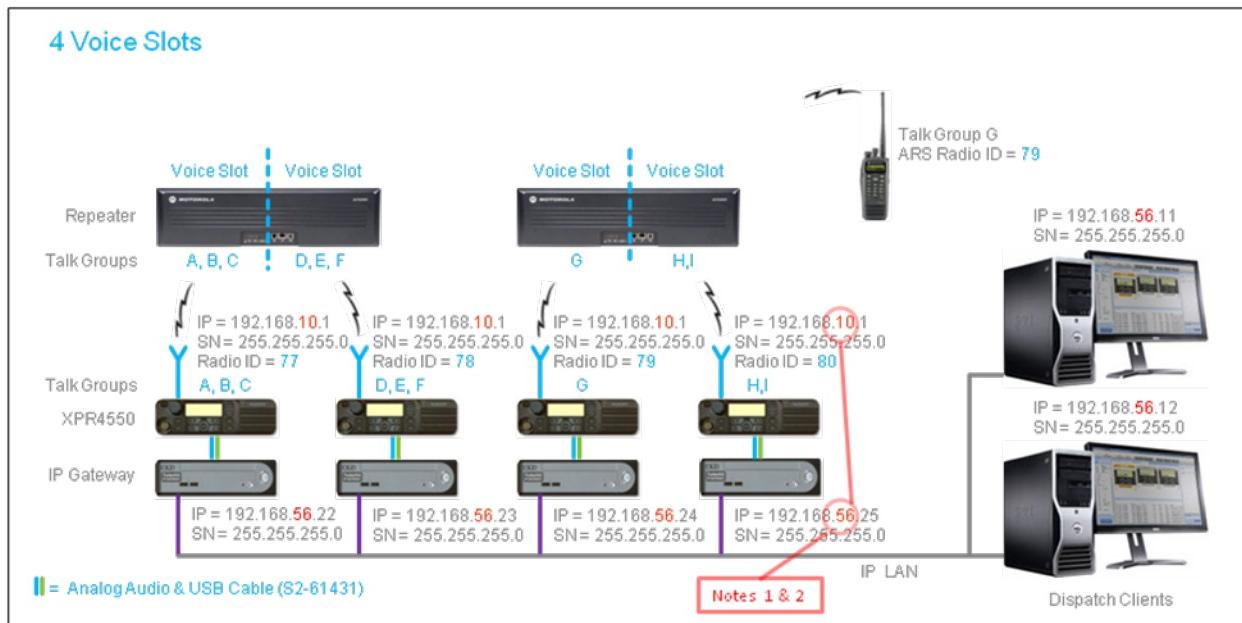
<i>Step #</i>	<i>Description</i>	<i>See Document #</i>	<i>Optional</i>
1a	Configure and Install Control Station Radio(s) (XPR4550)	S2-61534 IP Gateway Installation	
1b	Configure and Install TurboVUi IP Gateway(s)	S2-61534 IP Gateway Installation	
2	Configure Port Forwarding on Firewall Device	S2-61534 IP Gateway Installation	✓
3	Configure repeater(s) for Enhanced GPS option	S2-61654 System Planner	✓
4	Configure Subscriber Radios for ARS and GPS	S2-61534 IP Gateway Installation	✓
5a	Install and configure TurboVUi Solo Clients	S2-61568 Solo Client Installation	✓
5b	Install and configure TurboVUi Dispatch Clients	S2-61535 Dispatch Client Installation	✓
5c	Install and configure TurboVUi Pocket apps (for Android™ and iPhone™/iPad™ mobile devices)	S2-61620 Pocket App Installation	✓

SYSTEM EXAMPLES

The System Example diagrams in this section represent some of the configuration options for TurboVUi.

CONVENTIONAL DIGITAL OR ANALOG SYSTEM WITHOUT DATA REVERT

For Conventional Digital or Analog MOTOTRBO systems without Data Revert slots, each **repeater voice slot** must have an associated XPR4550 Control Station radio and TurboVUi IP Gateway as indicated in the diagram below.



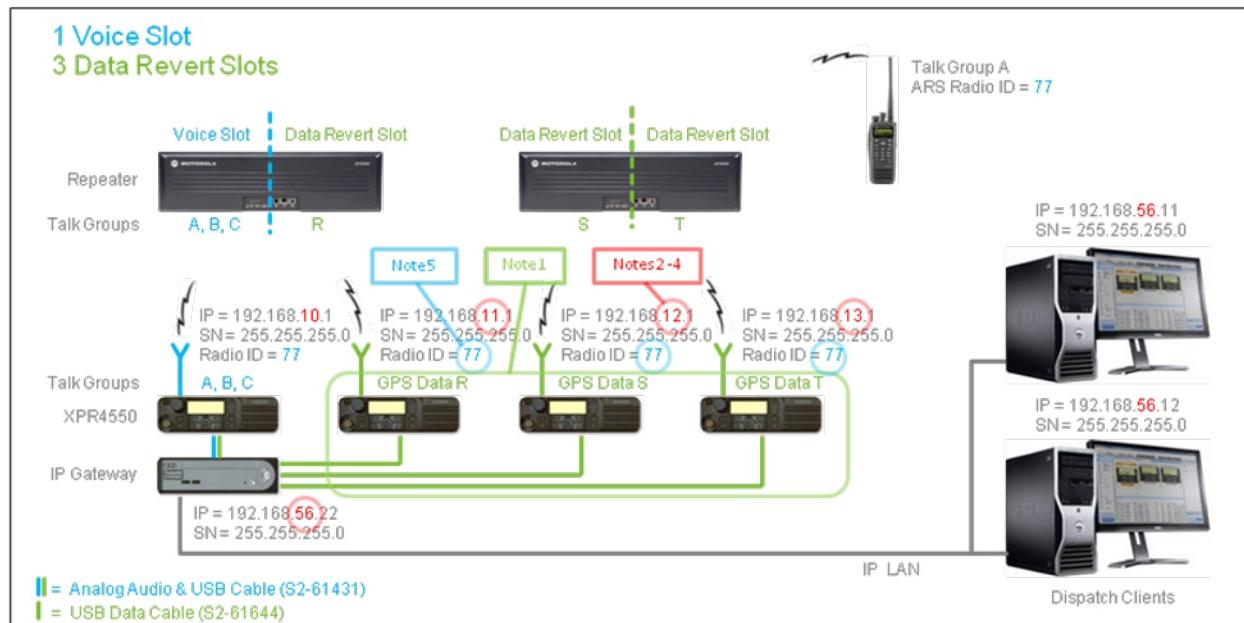
Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. IP Gateways must have a fixed IP Address. See **Notes 1 & 2** indicated in system diagram.
2. An IP Gateway and all radios connected to it must have unique subnets. See **Notes 1 & 2** indicated in system diagram.

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

CONVENTIONAL DIGITAL SYSTEM WITH DATA REVERT

For Conventional Digital systems with Data Revert slots, one TurboVUi IP Gateway can support one Voice Control Station Radio as well as three additional Data Revert Radios. The TurboVUi IP Gateway must have software version 5.1.5 or later.



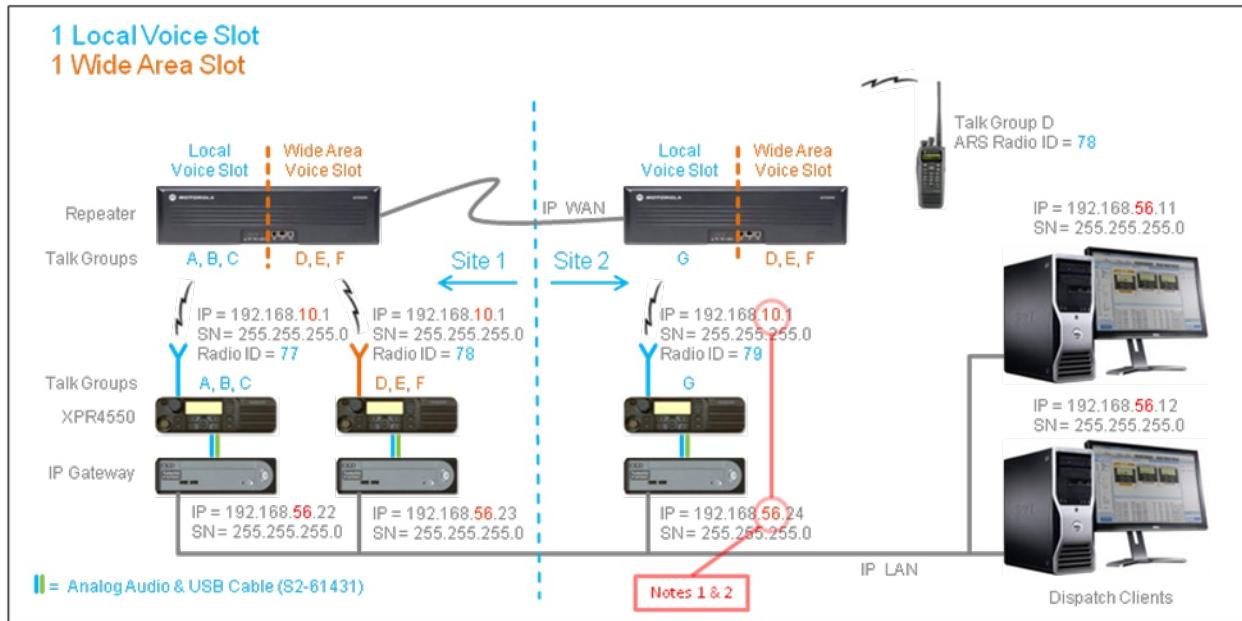
Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. An IP Gateway can support one Voice Radio and three Data Revert Radios. See Note 1 indicated in system diagram.
2. IP Gateways must have a fixed IP Address. See Notes 2 - 4 indicated in system diagram.
3. An IP Gateway and all radios connected to it must have unique subnets. See Notes 2 - 4 indicated in system diagram.
4. For radios sharing an IP Gateway, the IP address of the Voice Radio must be lower than the IP addresses of the Data Revert Radios. See Notes 2 - 4 indicated in system diagram.
5. All radios that share an IP Gateway must have the same Radio ID. See Note 5 indicated in system diagram.

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

IP SITE CONNECT SYSTEM WITHOUT DATA REVERT

For IP Site Connect systems without Data Revert slots, each **repeater voice slot** must have an associated XPR4550 Control Station radio and TurboVUi IP Gateway as indicated in the diagram below. One TurboVUi IP Gateway and XPR4550 Control Station Radio is required for each Local (non-IP Site Connect) slot. In addition, one TurboVUi IP Gateway and XPR4550 Control Station Radio is required for each wide area (IP Site Connect) “channel”. The TurboVUi IP Gateway and XPR4550 Control Station Radio supporting a wide area “channel” can be located at any site.



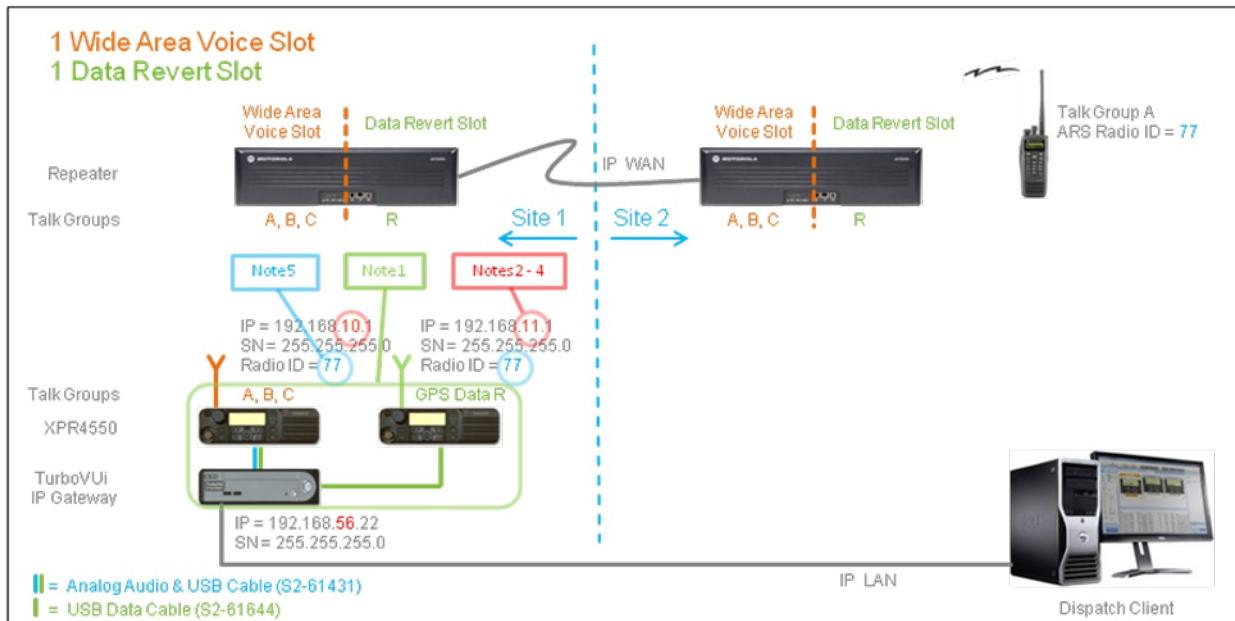
Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. IP Gateways must have a fixed IP Address. See **Notes 1 & 2** indicated in system diagram.
2. An IP Gateway and all radios connected to it must have unique subnets. See **Notes 1 & 2** indicated in system diagram.

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

IP SITE CONNECT SYSTEM WITH DATA REVERT

For IP Site Connect systems with Data Revert slots, one TurboVUi IP Gateway can support one Voice Control Station Radio as well as three additional Data Revert Radios. The TurboVUi IP Gateway must have software version 5.1.5 or later. One TurboVUi IP Gateway and XPR4550 Control Station Radio is required for each Local (non-IP Site Connect) slot. In addition, one TurboVUi IP Gateway and XPR4550 Control Station Radio is required for each wide area (IP Site Connect) “channel”. The TurboVUi IP Gateway and XPR4550 Control Station Radio supporting a wide area (IP Site Connect) “channel” can be located at any site.

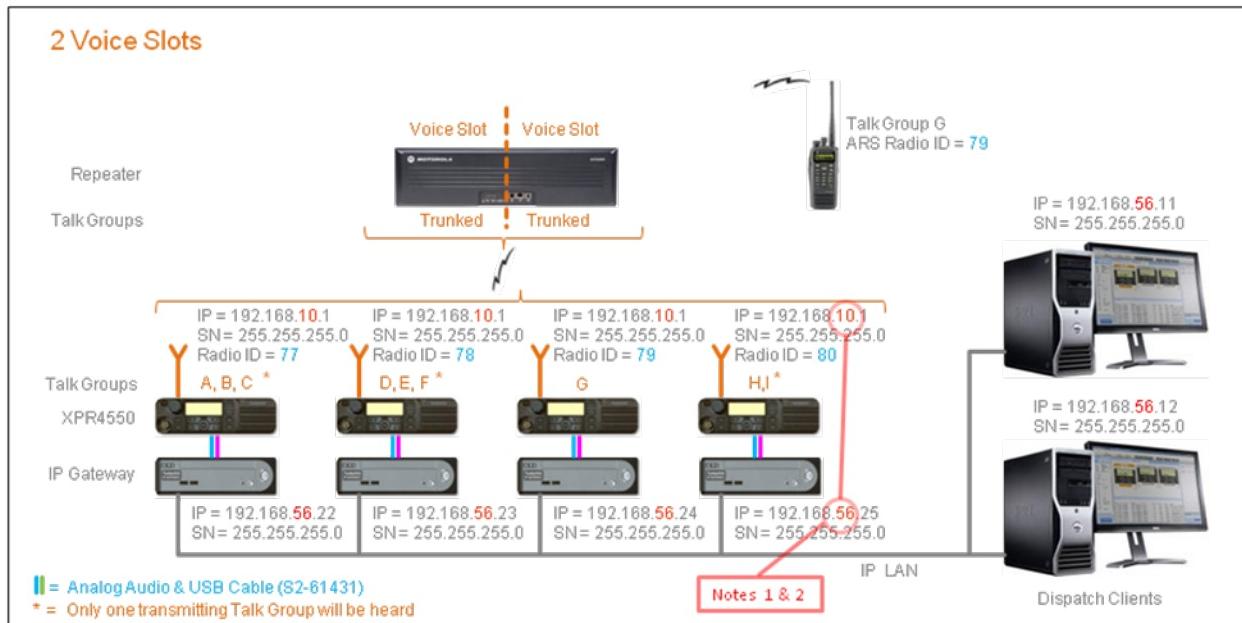


Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. An IP Gateway can support one Voice Radio and three Data Revert Radios. See **Note 1** indicated in system diagram.
 2. IP Gateways must have a fixed IP Address. See **Notes 2 - 4** indicated in system diagram.
 3. An IP Gateway and all radios connected to it must have unique subnets. See **Notes 2 - 4** indicated in system diagram.
 4. For radios sharing an IP Gateway, the IP address of the Voice Radio must be lower than the IP addresses of the Data Revert Radios. See **Notes 2 - 4** indicated in system diagram.
 5. All radios that share an IP Gateway must have the same Radio ID. See **Note 5** indicated in system diagram.
- See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

CAPACITY PLUS SYSTEM WITHOUT DATA REVERT

For Capacity Plus systems without Data Revert slots, multiple TurboVUi IP Gateway and Control Station Radio pairs may utilize a smaller number of trunked repeater slots as indicated in the diagram below.



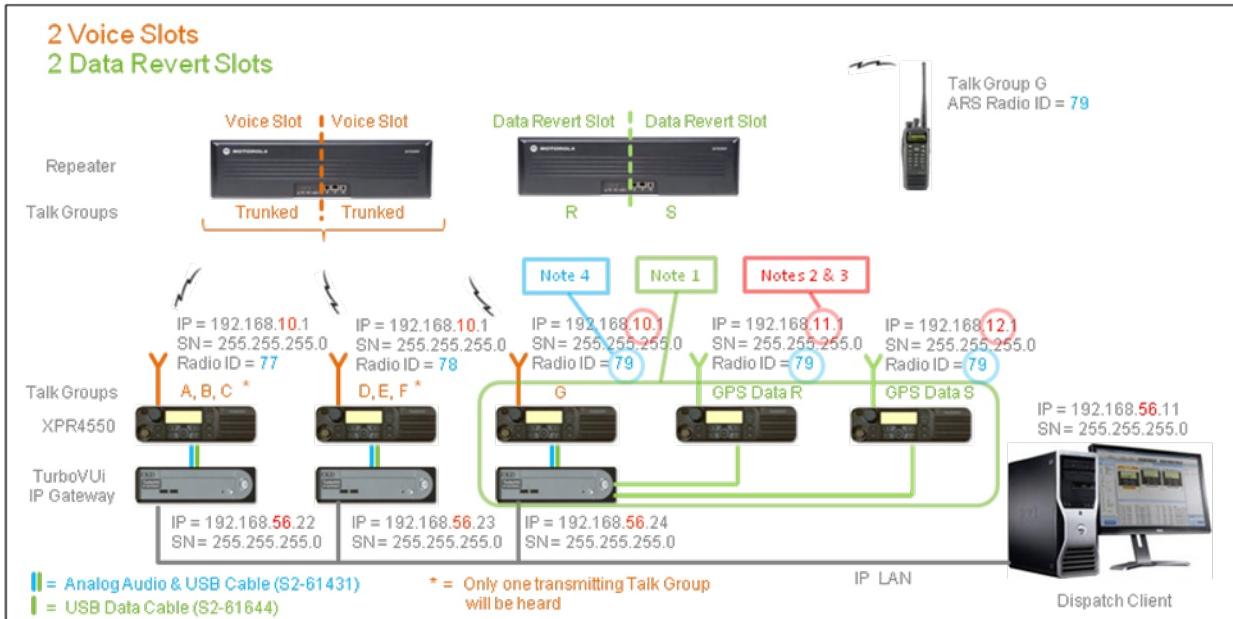
Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. IP Gateways must have a fixed IP Address. See **Notes 1 & 2** indicated in system diagram.
2. An IP Gateway and all radios connected to it must have unique subnets. See **Notes 1 & 2** indicated in system diagram.

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

CAPACITY PLUS SYSTEM WITH DATA REVERT

For Capacity Plus systems with Data Revert slots, multiple TurboVUi IP Gateway and Control Station Radio pairs may utilize a smaller number of trunked repeater slots as indicated in the diagram below. In addition, one TurboVUi IP Gateway can support one Voice Control Station Radio as well as three additional Data Revert Radios. The TurboVUi IP Gateway must have software version 5.1.5 or later.



Use the following notes when assigning IP Addresses and Radio IDs for components in the above system:

1. An IP Gateway can support one Voice Radio and three Data Revert Radios. See **Note 1** indicated in system diagram.
 2. IP Gateways must have a fixed IP Address. See **Notes 2 - 4** indicated in system diagram.
 3. An IP Gateway and all radios connected to it must have unique subnets. See **Notes 2 - 4** indicated in system diagram.
 4. For radios sharing an IP Gateway, the IP address of the Voice Radio must be lower than the IP addresses of the Data Revert Radios. See **Notes 2 - 4** indicated in system diagram.
 5. All radios that share an IP Gateway must have the same Radio ID. See **Note 5** indicated in system diagram.
- See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

ARS AND GPS SIGNALING

ARS SIGNALING

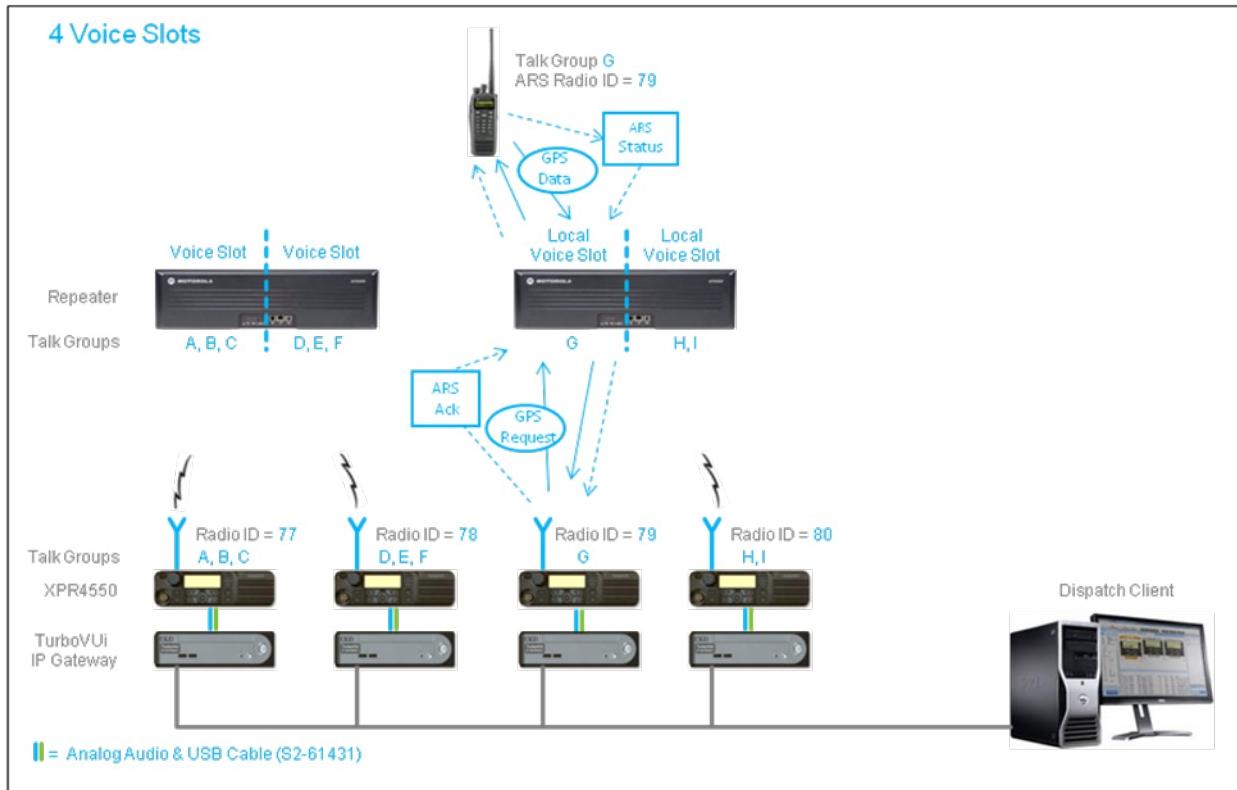
Applications such as TurboVUi often need to know the status of subscriber radios in a system. In order to satisfy this requirement, subscriber radios can be required to register with the application using **Automatic Registration Service (ARS)** messaging. The **ARS Status** message is reported by subscriber radios on a periodic basis to an application referred to as the **ARS Server**. If the subscriber radio does not receive an **ARS Acknowledgement** message from the **ARS Server** application, the subscriber radio will repeatedly resend the **ARS Status** message, flooding the channel with data message traffic. A TurboVUi IP Gateway performs the **ARS Server** function and will respond to the **ARS Status** message with an **ARS Acknowledgement** message. The **ARS Acknowledgement** message sent from the TurboVUi IP Gateway includes an “**ARS Subscriber Refresh Rate**”. The “**ARS Subscriber Refresh Rate**” tells the subscriber radios how often to resend **ARS Status** updates to the **ARS Server**, and is configured in the **ARS** tab of the ICU.exe. See the MOTOTRBO System Planner (Section 3.1.3.2 **Presence Notifier**) and the diagrams below for additional details.

GPS SIGNALING

A LRRP (Location Request Response Protocol) request for GPS (Global Positioning System) status is initiated by a TurboVUi IP Gateway. The target subscriber radio will respond with its GPS position data, which may also include speed, time, and other parameters. The target subscriber radio can be requested to provide a response to either an **Immediate Location Request** or a **Triggered Location Request**. An **Immediate Location Request** is answered by a subscriber radio with a single GPS status message. A **Triggered Location Request** is answered by a subscriber radio with periodic GPS status updates based on a time interval or an event such as radio key-up. **Immediate** and **Triggered Location Request** configuration parameters can be found in the **GPS** tab of the ICU.exe. See the MOTOTRBO System Planner and the diagrams below for additional details.

CONVENTIONAL DIGITAL SYSTEM WITHOUT DATA REVERT

In the following diagram, there are no dedicated **Data Revert** slots. In this case, the **GPS Request** message from the TurboVUI IP Gateway and the **GPS Data** status message from the subscriber radio use the same **Voice** repeater slot and **Voice** radio channel. Likewise, the **ARS Status** message from the subscriber radio and the **ARS Acknowledgement** message from the TurboVUI IP Gateway use the same **Voice** repeater slot and **Voice** radio channel.



CPS Configuration

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

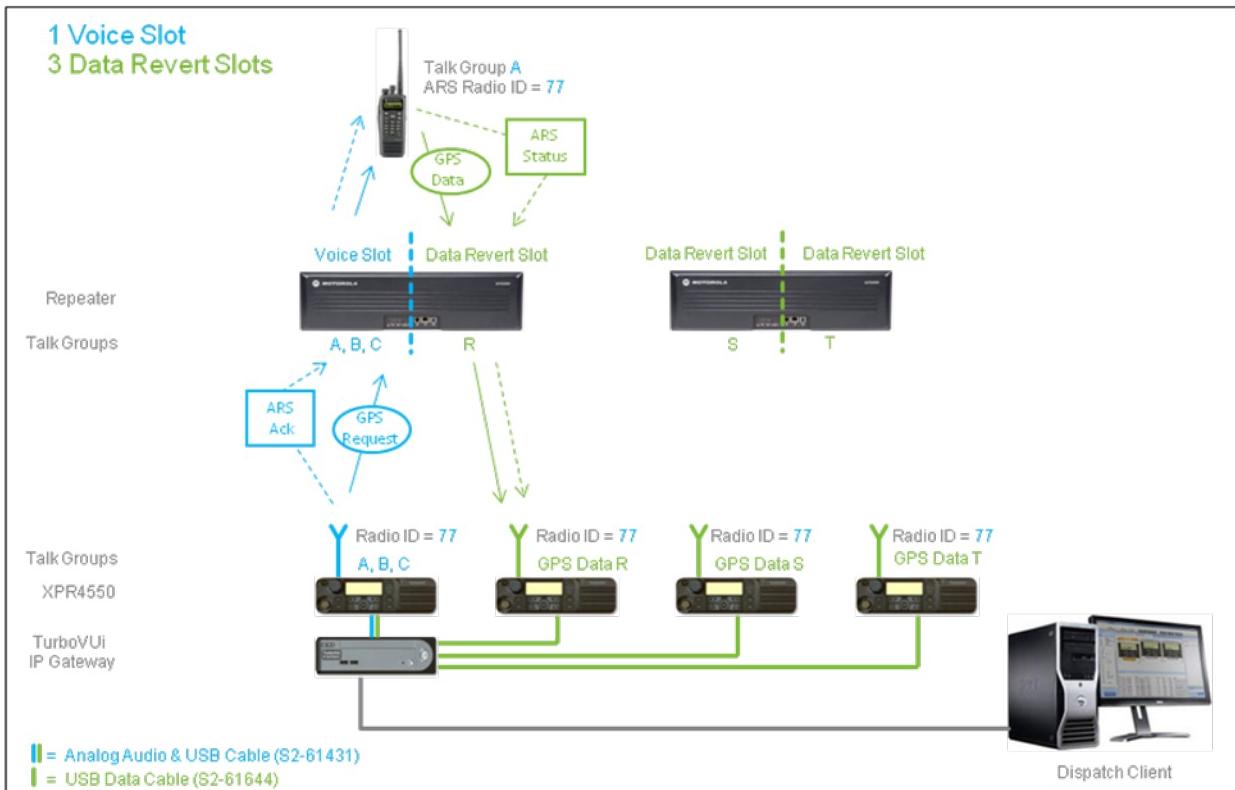
CONVENTIONAL DIGITAL SYSTEM WITH DATA REVERT

For Conventional Digital systems with **Data Revert** slots, one TurboVUi IP Gateway can support one **Voice** Control Station Radio as well as three additional **Data Revert** Radios. The TurboVUi IP Gateway must have software version 5.1.5 or later.

When **Data Revert** slots are used in a system, data messages from a TurboVUi IP Gateway are sent using a **Voice** radio and repeater slot. On the other hand, data messages from a subscriber radio are sent using a **Data Revert** repeater slot and a **Data** radio.

Specifically, a **GPS Request** message from the TurboVUi IP Gateway is sent using a **Voice** radio and repeater slot. The corresponding **GPS Data** status message from the subscriber radio is sent using a **Data Revert** repeater slot and radio..

Likewise, an **ARS Status** message from a subscriber radio is sent using a **Data Revert** repeater slot and radio. The corresponding **ARS Acknowledge** message from the TurboVUi IP Gateway is sent using a **Voice** radio and repeater slot.



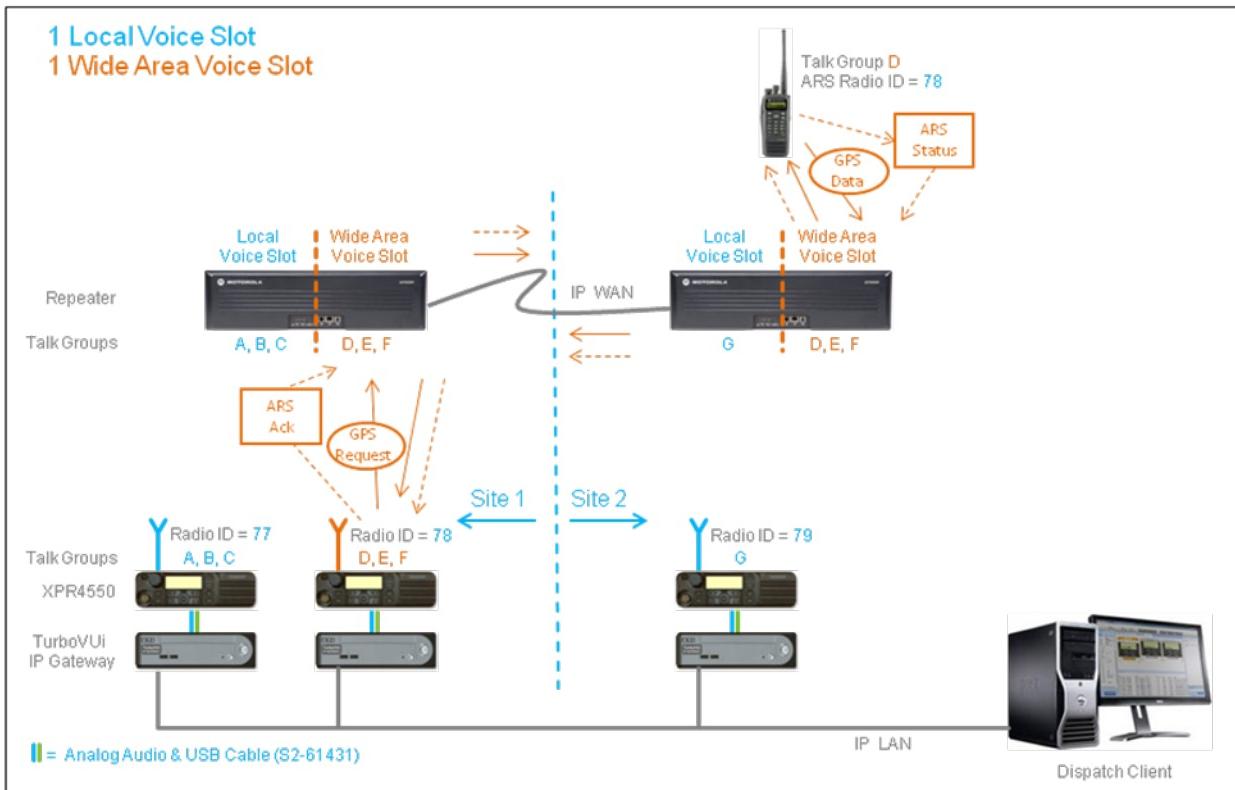
CPS Configuration

The “**GPS Revert**” parameter in CPS (*Channels > ZoneName > ChannelName*) must specify one of the listed Data Revert “*transmit digital channels*”.

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

IP SITE CONNECT SYSTEM WITHOUT DATA REVERT

In the following diagram, there are no dedicated Data Revert slots. In this case, the **GPS Request** message from the TurboVUi IP Gateway and the **GPS Data** status message from the subscriber radio use the same **Voice** repeater slot and **Voice** radio channel. Likewise, the **ARS Status** message from the subscriber radio and the **ARS Acknowledgement** message from the TurboVUi IP Gateway use the same **Voice** repeater slot and **Voice** radio channel.



CPS Configuration

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

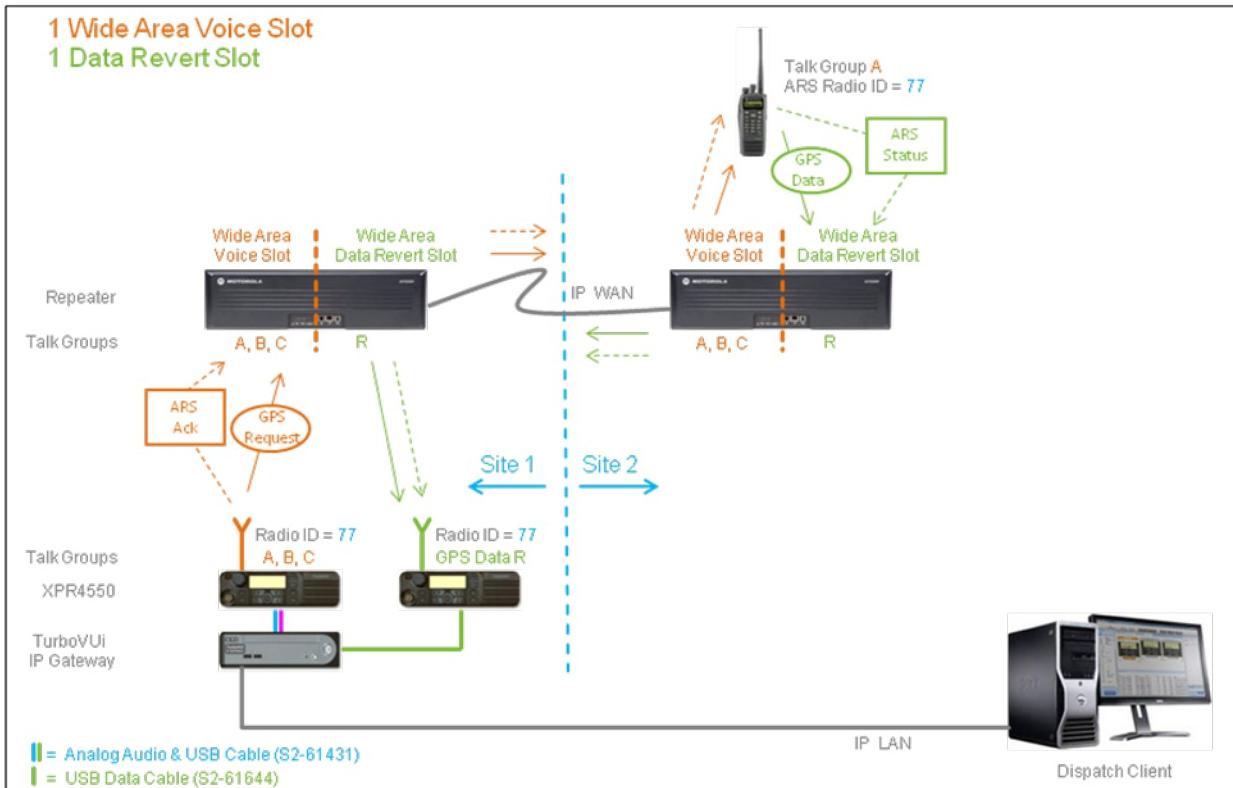
IP SITE CONNECT SYSTEM WITH DATA REVERT

For IP Site Connect systems with **Data Revert** slots, one TurboVUi IP Gateway can support one **Voice** Control Station Radio as well as three additional **Data Revert** Radios. The TurboVUi IP Gateway must have software version 5.1.5 or later.

When **Data Revert** slots are used in a system, data messages from a TurboVUi IP Gateway are sent using a **Voice** radio and repeater slot. On the other hand, data messages from a subscriber radio are sent using a **Data Revert** repeater slot and a **Data** radio.

Specifically, a **GPS Request** message from the TurboVUi IP Gateway is sent using a **Voice** radio and repeater slot. The corresponding **GPS Data** status message from the subscriber radio is sent using a **Data Revert** repeater slot and radio..

Likewise, an **ARS Status** message from a subscriber radio is sent using a **Data Revert** repeater slot and radio. The corresponding **ARS Acknowledge** message from the TurboVUi IP Gateway is sent using a **Voice** radio and repeater slot.



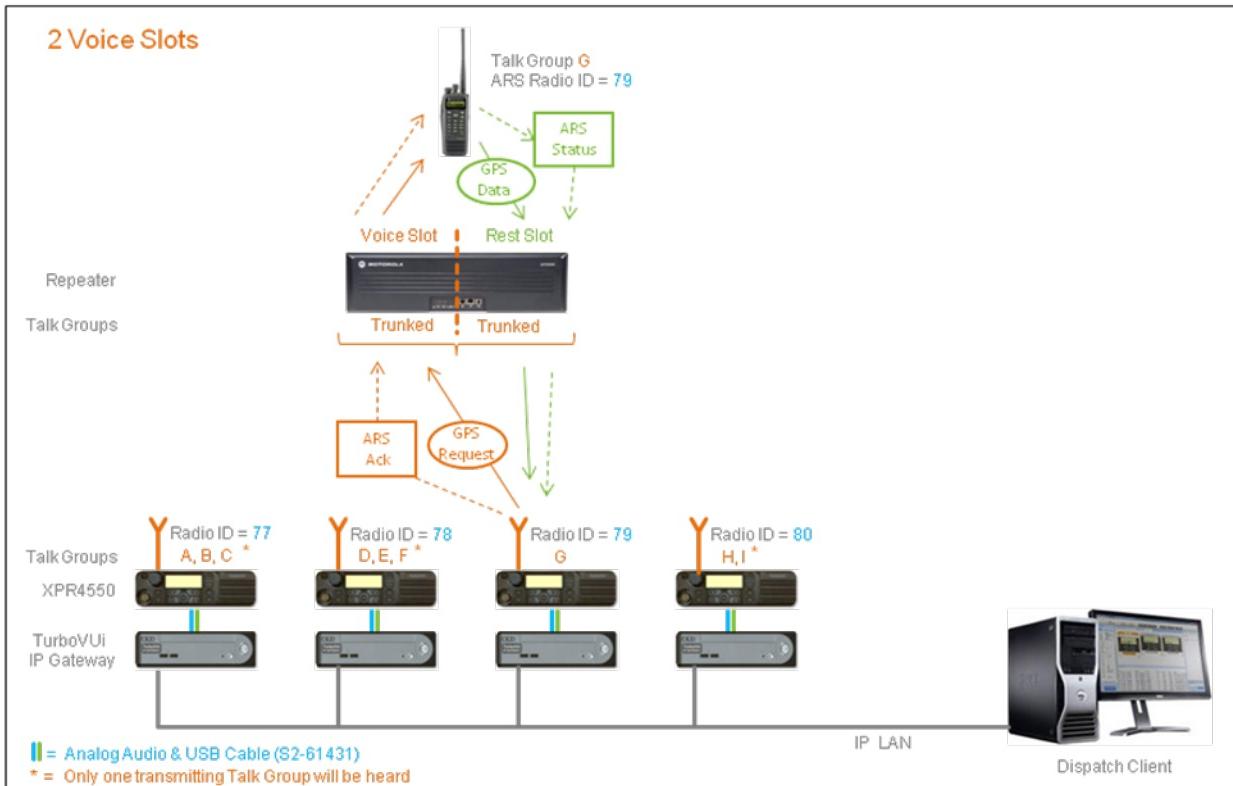
CPS Configuration

The “**GPS Revert**” parameter in CPS (*Channels > ZoneName > ChannelName*) must specify one of the listed Data Revert “*transmit digital channels*”.

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

CAPACITY PLUS SYSTEM WITHOUT DATA REVERT

In the following diagram, there are no dedicated Data Revert slots. In this case, the **GPS Request** message from the TurboVUi IP Gateway and the **GPS Data** status message from the subscriber radio use the same **Voice** repeater slot and **Voice** radio channel. On the other hand, the **ARS Status** message from the subscriber radio and the **ARS Acknowledgement** message from the TurboVUi IP Gateway use the **Rest** repeater slot and same **Voice** radio channel.



CPS Configuration

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

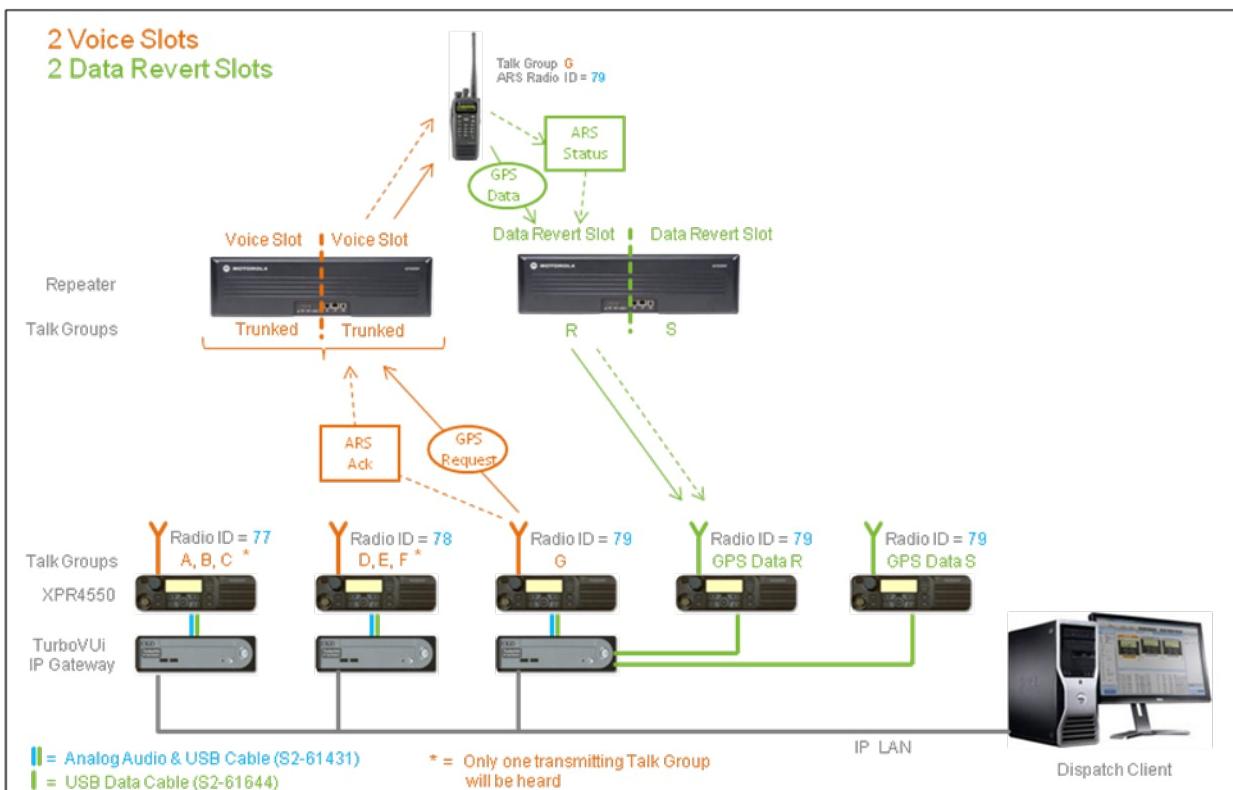
CAPACITY PLUS SYSTEM WITH DATA REVERT

For Capacity Plus systems with **Data Revert** slots, one TurboVUi IP Gateway can support one **Voice** Control Station Radio as well as three additional **Data Revert** Radios. The TurboVUi IP Gateway must have software version 5.1.5 or later.

When **Data Revert** slots are used in a Capacity Plus system, data messages from a TurboVUi IP Gateway are sent using a **Voice** radio and one of the trunked **Voice** repeater slots. On the other hand, data messages from a subscriber radio are sent using a **Data Revert** repeater slot and a **Data** radio.

Specifically, a **GPS Request** message from the TurboVUi IP Gateway is sent using a **Voice** radio and one of the trunked **Voice** repeater slots. The corresponding **GPS Data** status message from the subscriber radio is sent using a **Data Revert** repeater slot and **Data** radio..

Likewise, an **ARS Status** message from a subscriber radio is sent using a **Data Revert** repeater slot and **Data** radio. The corresponding **ARS Acknowledge** message from the TurboVUi IP Gateway is sent using a **Voice** radio and one of the trunked **Voice** repeater slots.



CPS Configuration

The “*Capacity Plus Data Channel List*” in CPS (*Capacity Plus > Data > ListName*) must be completed to list all Data Revert channels.

See CPS Configuration Tables on Page 25 for additional setup details for Control Station radios and Subscriber radios.

MOTOROLA ENHANCED GPS REPEATER OPTION

COMPARISON WITH STANDARD DATA REVERT

The “Enhanced GPS” repeater option available from Motorola is an inexpensive way to dramatically improve GPS data throughput in a system with Data Revert repeater slots. The license for this option is purchasable from Motorola for either new repeaters or an upgrade to existing repeaters. The following table compares two systems, each with a requirement to update 225 radio subscribers once every minute. Each system has data revert slots for transferring the GPS data from subscriber radios.

<i>Enhanced GPS Option?</i>	<i>Data Reliability</i>	<i>Required Data Revert Repeater Slots</i>	<i>Required Data Revert Repeaters</i>
No	100%	12	6
Yes	100%	2	1

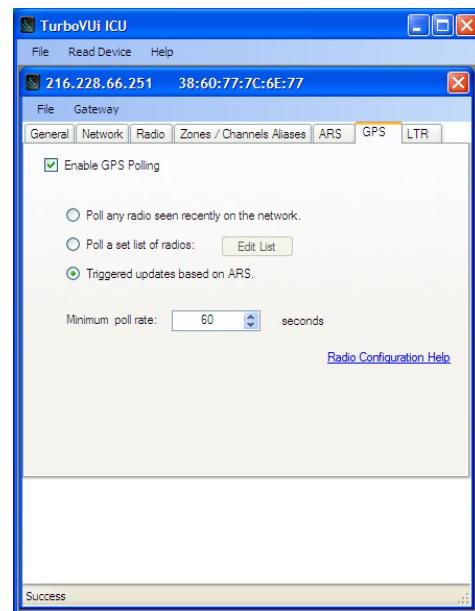
CONFIGURATION REQUIREMENTS

TurboVUi IP Gateways, MOTOTRBO™ repeaters, and subscriber radios must be configured to correctly use the “Enhanced GPS” repeater option.

TurboVUi IP Gateways

The ICU.exe utility must be used to configure the settings in the GPS tab as shown at right.

- ✓ Place a check in the box for “Enable GPS Polling”.
- ✓ Choose the update method “Triggered updates based on ARS”.
- ✓ Specify a “Minimum poll rate” of 30, 60, 120, 240, or 480 seconds. These are the only values that are supported by the “Enhanced GPS” option.



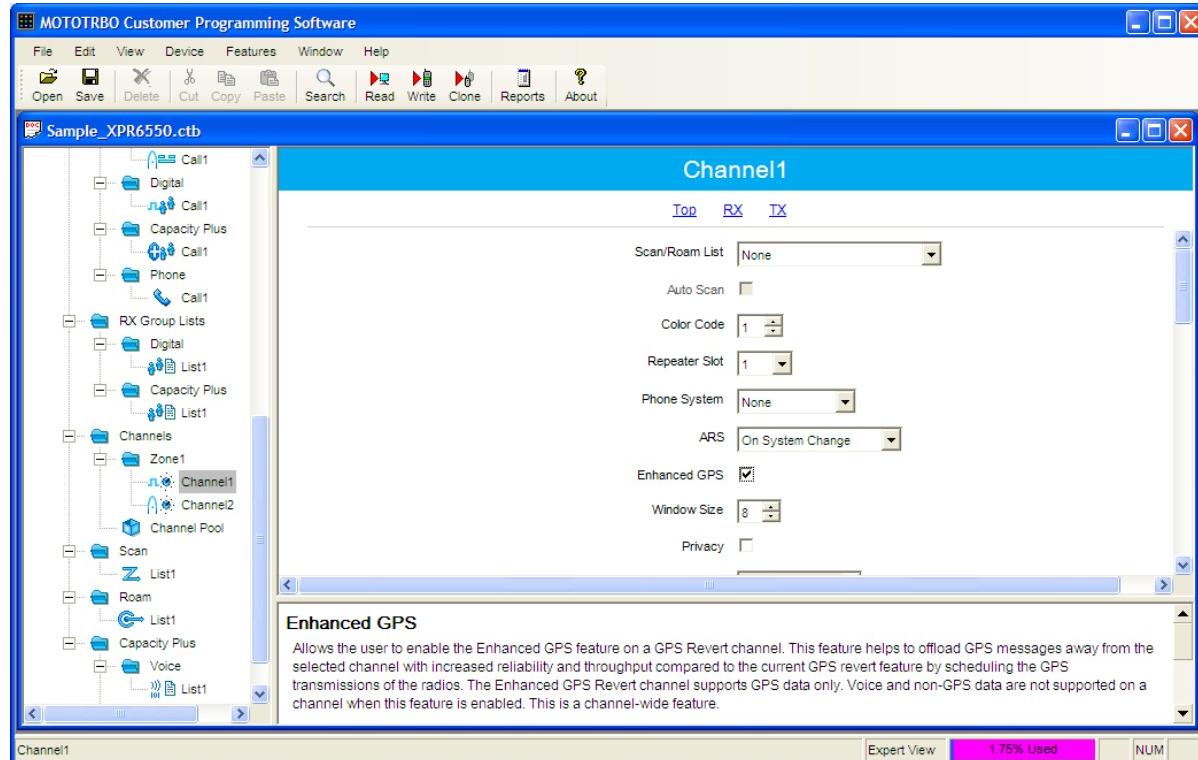
MOTOTRBO™ Repeaters

The MOTOTRBO™ repeaters used for Data Revert channels must have the “Enhanced Repeater” option enabled. Contact Motorola for ordering information.

Subscriber Radios

Motorola CPS (Customer Programming Software) must be used to configure the subscriber radios for “Enhanced GPS” as shown below. The following parameters must be set globally in the radio system for each subscriber radio.

- ✓ Place a check in the box for “Enhanced GPS”.
- ✓ Choose a “Window Size” of “8”.



CPS Configuration Tables

CPS Setup for Subscriber Radios

Folder	Sub-Folder	Parameter	Setting
General		GPS	Enable (if applicable)
Network		ARS Radio ID	Must match Radio ID of control station connected to IP Gateway
		TMS Radio ID	Must match Radio ID of control station connected to IP Gateway
Channels	ZoneName, ChannelName	ARS	On System Change
		Enhanced GPS	Enable (if applicable)
		Window Size *	8 Window Size = ((LRRP Response Size +1) div 12) + 3
		GPS Revert	If no Data Revert: Selected If Data Revert: Channel Name of Data Revert Channel
		Data Call Confirmed	Disable

CPS Setup for Control Station Radios

Folder	Sub-Folder	Parameter	Setting
General Settings		Radio ID	Voice Radio and 1-3 Data Revert Radios that share an IP Gateway must have the same Radio ID
		Analog Mic AGC	Disable
		Digital Mic AGC	Disable
Accessories		Ignition Sense	On/Off Or Ignition
		Analog Rear Mic Gain	+ 10dB: May need to be adjusted for appropriate audio level transmitted from TurboVUI client
		Digital Rear Mic Gain	+ 10dB: May need to be adjusted for appropriate audio level transmitted from TurboVUI client
		Cable Type	Rear PC and Audio
Network		Radio IP	For radios sharing an IP Gateway, the IP address of the Voice Radio must be lower than the IP addresses of the Data Revert Radios. An IP Gateway and all radios connected to it must have unique subnets.
		Forward to PC	Enable
Signaling Systems	MDC, Digital, or Capacity Plus	System	Choose appropriate parameters for the signaling system being added for All-Emergency function
Contacts	MDC, Digital, or Capacity Plus	add Group Call	Add Group Call contact for the Group Call function
		add All Call	Add All-Call contact for the All-Call function
Channels	Digital	Data Call Confirmed	Disable for all channels
	Digital	Emergency System	Choose appropriate Emergency ID for All-Emergency function
	Analog	Signaling System	Choose appropriate Emergency ID for All-Emergency function

Note: For LTR Trunking, see additional setup requirements in TurboVUI IP Gateway Installation Guide, Document # S2-61534.

SYSTEM DESIGN RESOURCES

MOTOTRBO SYSTEM DESIGN TOOLS

Motorola has created a toolset to help in estimating system resources in the following areas:

- Capacity Plus System Estimator
- Connect Plus System Estimator (Note: TurboVUi will not function in Connect Plus systems until Motorola releases Version 1.3 for the radios.)
- Conventional Loading Calculator
- Enhanced GPS Calculator
- Connect Plus Site Link Bandwidth Calculator (Note: TurboVUi will not function in Connect Plus systems until Motorola releases Version 1.3 for the radios.)
- IP Site Connect Bandwidth Calculator

The above Tool Set is available on the MOL (Motorola On-Line) site using the following folder path in the **Resource Center** tab:

Resource Center tab

> Software
> Two-Way
> MOTOTRBO
> Data Applications
> MOTOTRBO System Design Tools

Some System Design Tools use unrealistic parameter values in their calculation, especially for Motorola's Enhanced GPS option. For example, the Capacity Plus System Estimator uses a Window Size of 5, and GPS Update Allocation of 100%. Results obtained using these values yields a capacity of 128 GPS updates per minute per repeater slot, however this is not a practical number.

A more realistic system would have a Window Size of 8, and GPS Update Allocation of 90%. Using these input parameter values, the more practical capacity is 113 GPS updates per minute per repeater slot. This is still about six times improvement over a system without the "Enhanced GPS" repeater option, so is much more efficient use of repeater slots.

TURBOVUI SYSTEM PLANNER TEMPLATE

Use the System Planner Template at the end of this document to record device names, passwords, and IP addresses.

APPENDIX**APPENDIX - IP ADDRESSING**

Normally, the factory default IP Address programmed into the XPR4550 Control Station radio **should not be changed**. However, it must be on a different subnet than the TurboVUi IP Gateway that is connected to it via the Rear Accessory Connector.

For example, if the network's Subnet Mask is 255.255.255.0, then at least one of the first three octets of the MOTOTRBO Radio IP address must be different than the TurboVUi IP Gateway module IP address.

The following **IS NOT** a valid IP addressing scheme since both devices are on the **SAME** subnet:

	XPR4550 Control Station	TurboVUi IP Gateway
IP Address:	192.168.12.2	192.168.12.3
Subnet Mask:	255.255.255.0	255.255.255.0

The following **IS** a valid IP addressing scheme since the devices are on **DIFFERENT** subnets:

	XPR4550 Control Station	TurboVUi IP Gateway
IP Address:	192.168.12.2	192.168.10.3
Subnet Mask:	255.255.255.0	255.255.255.0

For additional information see Cisco's **IP Addressing and Subnetting for New Users**, Document ID 13788, located at:
http://www.cisco.com/en/US/tech/tk365/technologies_tech_note09186a00800a67f5.shtml

APPENDIX - CONFIGURING PORT FORWARDING ON ROUTERS

If TurboVUi clients (such as Solo, Dispatch, or Pocket) will access an IP Gateway from a different IP network, then the IT Administrator must configure port forwarding within the firewall or router that separates the TurboVUi IP Gateway from other networks. This is also true when one or more of the clients listed above connects to a TurboVUi IP Gateway from the Internet.

The IP port used by a TurboVUi IP Gateway is **fixed at TCP Port 48222**.

The default IP port used by TurboVUi clients is TCP Port 48222. However, any other port may be specified during the login from any TurboVUi client by specifying this port number as in the following example:

100.100.100.33:7777

where:

100.100.100.33 is the public (or external or wide-area) address of the firewall or router, and,
7777 is the external port of that firewall that will be port-forwarded to the private (or internal or local-area) TCP Port 48222.

See www.portforwarding.com for detailed instructions for the specific router in use at your site.

APPENDIX – IP GATEWAY SPECIFICATIONS***Mechanical and Environmental***

Dimensions:	8.25”w x 2.5”h x 11.5”d
Weight:	3 lbs.
Temperature Range:	0-50 °C
Humidity:	10-95% non-condensing

Electrical

AC Input (with included Power Adapter):	100–240Vac, 0.25A max, 50-60Hz
DC Input (optional):	11.5-12.5Vdc, 2.5A max

Miscellaneous

MOTOTRBO Interface	DE-9 Female & USB (Cable S2-61431 Included)
Transmit/Receive Impedance	600 ohms
Clients Supported	36 Solo plus Pocket, 12 Dispatch
Power-On	Auto
Network Bandwidth (for each connected client)	2.2k Bytes per Second with audio compression enabled 22k Bytes per Second without audio compression
Port Forwarding (for Firewall Configuration)	TCP Port 48222
PTT Relay (for LTR only)	SPST, 250mA max

APPENDIX - REFERENCE DOCUMENTS

<i>CTI Part #</i>	<i>Description</i>
S2-61534	TurboVUI IP Gateway Installation Guide
S2-61568	TurboVUI Solo Client Quick-Start Guide
S2-61432	TurboVUI Solo Client User Guide
S2-61620	TurboVUI Solo Pocket App Quick-Start Guide for Android™ and iPhone™ mobile devices
S2-61535	TurboVUI Dispatch Client Software Installation Guide
S2-61577	TurboVUI Dispatch Client User Guide
S2-61609	TurboVUI IP Gateway Logging Recorder Interface Guide

APPENDIX - REPLACEMENT PARTS

<i>CTI Part #</i>	<i>Description</i>	<i>Notes</i>
S3-61530	TurboVUI IP Gateway	Includes power supply
S2-61431	Cable, Radio Interface for Audio and Control	Interface cable between IP Gateway and XPR4550, for Audio and Control
S2-61664	Cable, Radio Interface for Data Revert (Control only)	Interface cable between IP Gateway and XPR4550, Control only for Data Revert
S2-60760	Cable, Cat 5 RJ45 Cross-over, 3 ft	Used with ICU.exe during IP Gateway configuration only
89-10712	Cable, Cat 5 RJ45, 10 ft	Can be used to connect IP Gateway to LAN
S1-61611	Cable Kit, Logging Recorder Interface	Used to connect IP Gateway to third party logging recorder
S2-61593	Diode Dropping Assembly	Used between a standard 13.8VDC supply and IP Gateway to reduce the voltage to the required 12VDC input
S2-61565	CD, TurboVUI IP Gateway	Contains ICU.exe, Solo Client Install Program, and manuals
S2-61506	CD, TurboVUI Dispatch Client Software	Contains Dispatch Client, Solo Client, ICU.exe, Time Server, and manuals

SYSTEM PLANNER TEMPLATE**PAGE 1 OF 2****TURBOVUI IP GATEWAYS**

See TurboVUi IP Gateway Installation Guide, document # S2-61534 for more information.

Parameters Common to all IP Gateways

ICU.exe Admin Password for ICU.exe, default is "admin"	Dispatch Client Password for Dispatch client connections default is "user"	NTP Server IP Address Network Time Protocol

Parameters Unique to Each IP Gateway

GPS = GPS Data Revert. Each IP Gateway supports 1 Voice & 3 GPS Data Radios.	Name <i>IP Gateway name has max 2 lines, 24 chars per line</i>	Serial #	IP Address	Subnet Mask	Default Gateway
IP Gateway A	Example Gateway Name	1234	192.168.56.22	255.255.255.0	192.168.56.1
Voice Radio A0	Example Radio VR A0		192.168.10.1	255.255.255.0	
GPS Radio A1	Example Radio GPS A1		192.168.11.1	255.255.255.0	
GPS Radio A2	Example Radio GPS A1		192.168.12.1	255.255.255.0	
GPS Radio A3	Example Radio GPS A1		192.168.13.1	255.255.255.0	
IP Gateway B					
Voice Radio B0					
GPS Radio B1					
GPS Radio B2					
GPS Radio B3					
IP Gateway C					
Voice Radio C0					
GPS Radio C1					
GPS Radio C2					
GPS Radio C3					
IP Gateway D					
Voice Radio D0					
GPS Radio D1					
GPS Radio D2					
GPS Radio D3					
IP Gateway E					
Voice Radio E0					
GPS Radio E1					
GPS Radio E2					
GPS Radio E3					

If additional IP Gateways are needed, copy this page.

See next page for System Planner Template Page 2 of 2

SYSTEM PLANNER TEMPLATE**PAGE 2 OF 2****TURBOVUI DISPATCH CLIENTS**

See TurboVUI Dispatch Software Installation Guide, document # S2-61535 for more information.

**Parameters Common
to all Dispatch Clients**

Administrator Password for Edit Mode

**Parameters Unique
to all Dispatch Clients**

PC Name	USB Key Serial #	Licensed IP Gateway Connections

TURBOVUI SOLO CLIENTS

See TurboVUI Solo Quick-Start Guide, document # S2-61568 for more information.

Parameters Common to all Solo Clients

Administrator Login Name Not Editable	Administrator Password default is "admin"
admin	

User Login Name default is "user"	User Password default is "user"

If additional Solo Client logins are needed, copy this page.